1. Introduction

This document is the regional water plan for the Jemez y Sangre Water Planning Region (Figure 1), prepared under the auspices of the Jemez y Sangre Water Planning Council (JySWPC or Council). Water rights holders and other stakeholders from the northern two-thirds of Santa Fe County, all of Los Alamos County and the southeastern part of Rio Arriba County formed this Council. Altogether, 24 stakeholder organizations signed a cooperative agreement committing to participate in the development of a regional water plan.

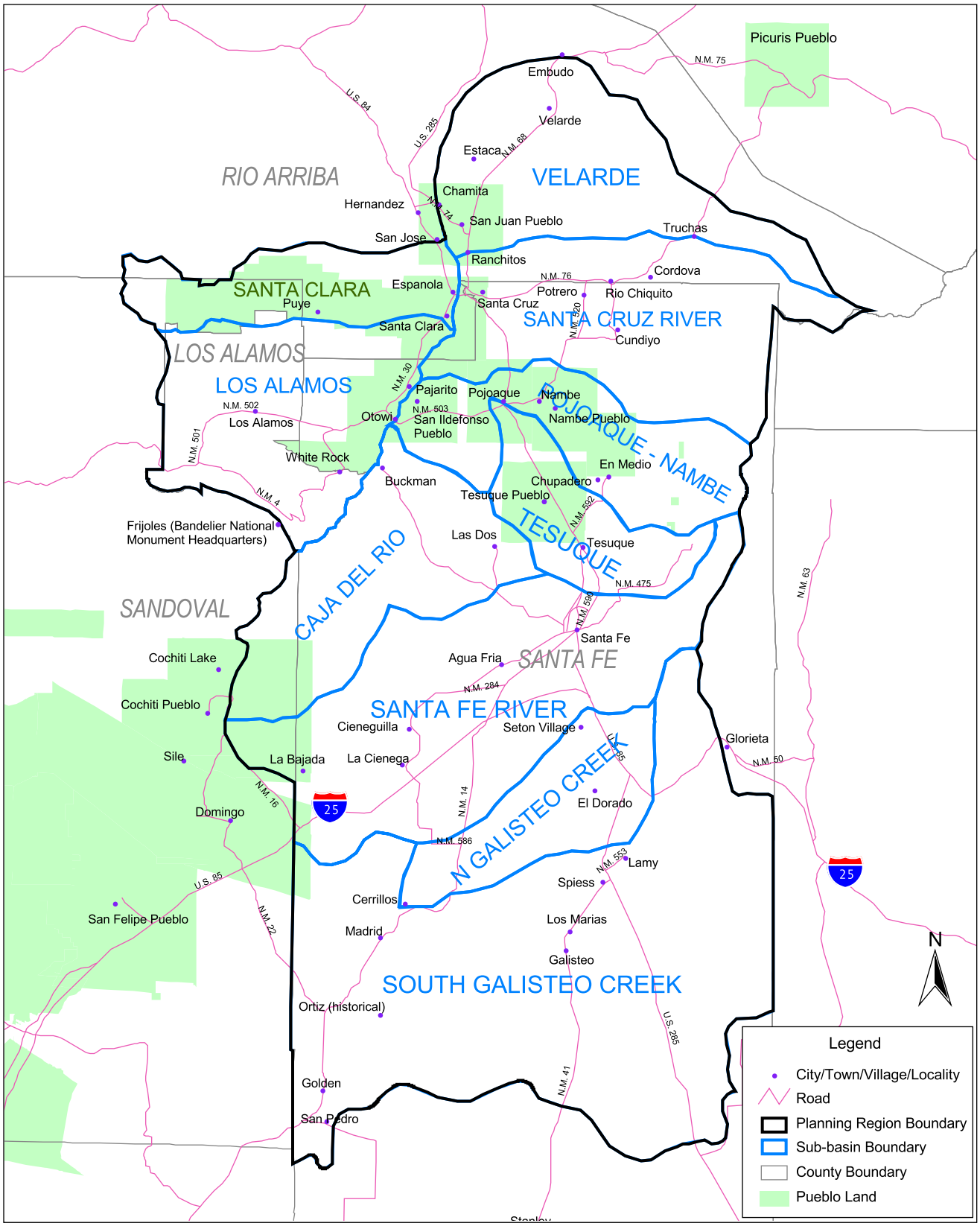
1.1 Purpose of Regional Water Planning

Regional water planning in New Mexico is the direct result of a 1987 federal court ruling that found New Mexico's prohibition against the out-of-state transfer of New Mexico groundwater to be unconstitutional. This ruling made it clear that New Mexico must actively plan for its water future. Regional water plans are used to budget water and thus help ensure the continuity of the water supply. In essence, regional water planning means understanding existing and potential water resource limitations and opportunities. It also means understanding the tradeoffs involved with different alternatives for meeting future water needs.

There are 16 water planning regions in New Mexico, established by the Interstate Stream Commission (ISC). Each region can write its own water plan for the ISC to accept and integrate into a statewide water plan. Public participation is important in the development of regional water plans to ensure local acceptance and to increase the plan's effectiveness in contributing to state decision-making concerning issues related to public welfare and conservation. Also, because regional water planning may be used as legal evidence of need and feasibility of supplying a need from specific sources, regional water plans should be "reliable, specific, technically sound, and based on generally acceptable hydrologic and engineering principles" (ISC, 1994).

Regional water plans assess water resources through:

- Determining the quantity and quality of water resources.



Source: Duke, 2001 (Figure 1-1)

JEMEZ Y SANGRE REGIONAL WATER PLAN

Jemez y Sangre Water Planning Region and Sub-Basins

Figure 1

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- Projecting population and other water resource demands under a range of conditions.

- Determining alternative approaches to meet projected demands through managing and conserving water supplies available to the region in accordance with existing rights, water supplies, interstate agreements, and court decrees.

1.1.1 Issues Specific to the Jemez y Sangre Water Planning Region

Major water resource challenges specific to the Jemez y Sangre Water Planning Region include:

- *Projected growth with little "new water" available to meet projected demands:* The only "unused" water in the region is San Juan-Chama (SJC) Project water held by the City of Española and Los Alamos County and return flow credits on the City of Santa Fe's SJC water.

- *Vulnerability of SJC water:* The "firm yield" of the SJC project water is not as firm as originally thought, particularly after the record low flows in 2002, potential claims by the Navajo Nation, and the August 2002 ruling by U.S. District Judge James A. Parker that the U.S. Bureau of Reclamation should release SJC water for the endangered silvery minnow.

- *Impact of domestic wells on senior water rights:* Because the Office of the State Engineer (OSE) does not restrict the use of domestic wells and because other water rights are difficult to obtain, much of the growth in the region is sustained by domestic wells. These wells impact both aquifer water levels and streamflow.

- *Unpredictable surface water supply:* The City of Santa Fe and the acéquias depend, at least in part, on surface water to meet the water demand, yet this supply is unpredictable in our semiarid region.

- *Ongoing water rights adjudication and litigation impedes water planning:* The lack of completed adjudications means that water rights are unquantified. It is difficult and possibly misleading to plan for use of a resource when that resource may not be available for use. Unquantified early priority Pueblo water rights also lend a degree of uncertainty regarding the amount of water available to other entities in the region.

- *Effects of Rio Grande Compact on water management:* The Rio Grande Compact (Compact) must be considered in nearly all water resource management decisions because it requires that 1929 conditions on the Rio Grande are maintained. The use of the Otowi Gage as a measuring station for Compact water has, thus far, restricted the transfer of water rights from the north to the south of the gage. The amount of water held in storage in Santa Fe Canyon reservoirs is also impacted by the Compact.

- *Jurisdictional issues*: These pose a problem for water resource management because the region includes significant parts of three counties, two cities, and eight pueblos as well as numerous villages, mutual domestic water associations, and acéquias. State and federal governments also have jurisdiction in certain circumstances. Actions taken by these various entities are often inconsistent, as in the conflict between the 100-year "life time" of the aquifer specified in the Santa Fe County Code and Compact obligations that require that the aquifer continue to discharge to the Rio Grande.

- *Water quality problems:* Quality issues such as groundwater contamination exist throughout the region, impacting the availability and cost of water.

- *Other unresolved issues*. Resource planning is more difficult because of ongoing unresolved issues. For instance, studies have not yet been completed to determine how to manage water resources to maintain riparian corridors and meet Endangered Species Act (ESA) obligations.

1.1.2 Purpose of the Jemez y Sangre Regional Water Plan

The purpose of the Jemez y Sangre Regional Water Plan is to assess the future water needs of the region and determine the feasibility of supplying or reducing these needs over the next 60 years, given the uncertainties described above. The planning process considers the public welfare and conservation issues of all stakeholders through a public participation process. The objectives of this plan are to define the available water supply (renewable and stored), determine the water demand (present and future), and develop alternatives for meeting demand. While working to meet these objectives, historical rights and uses must be respected and public welfare issues of regional importance such as quality of life and preservation of the environment must be addressed. Because the JySWPC does not have authority to implement many of the actions that will be required to address future water supply challenges, this plan outlines options to aid decision makers as they move forward on implementation. The plan provides recommendations about actions for which the JySWPC has reached consensus and, when opinions are divided, characterizes the diverse viewpoints held by Council members and participants.

1.2 Jemez y Sangre Water Planning Council

The JySWPC was created through a series of meetings, primarily with water diverters within the region. The meeting participants defined the region, named the planning entity the Jemez y Sangre Water Planning Council, and drafted language for a cooperative agreement. This cooperative agreement established the JySWPC as a legal entity. Both the cooperative agreement and the organization's bylaws are provided in Appendix A.

Official members of the JySWPC who signed the cooperative agreement are:

- Acéquia Madre de Santa Fe
- Amigos Bravos
- Bureau of Indian Affairs
- Bureau of Reclamation
- Los Alamos National Laboratory/ Department of Energy
- New Mexico Rural Water Association
- North Central New Mexico Economic Development District
- Pojoaque Valley Irrigation District

- City of Española
- City of Santa Fe
- Eldorado Area Water & Sanitation District
- Garcia Ditch
- Las Acéquia de la Cañada Ancha
- Las Acéquias de Chupadero
- League of Women Voters
- Los Alamos County Public Utilities
- Rio Arriba County
- Rio Grande Restoration
- Santa Fe Area Home Builders Association
- Santa Fe County
- Santa Fe Land Use Resource Center
- State Land Office
- Santa Fe Pojoaque Soil and Water Conservation District
- 1000 Friends of New Mexico

Six of the eight Pueblos in the region have attended the meetings and stated that, for the present, they prefer to participate as observers. Santo Domingo and Pojoaque Pueblos have not attended the meetings, but the City of Santa Fe has met with each Pueblo individually to explain the purpose of regional planning and to invite their participation in the process. Pueblo representatives have indicated that they realize considerable benefits can be gained from regional water planning efforts, but are concerned that many past regional water planning efforts have resulted in attempts to achieve a de facto quantification of the Pueblos' water rights. The Pueblos view this, whether it is done implicitly or explicitly, as an attempt to limit their tribal water rights. Thus, the Pueblos have chosen to participate as observers in the planning process. This means the Pueblos send representatives to planning meetings, and these representatives make comments and ask questions on behalf of their respective Pueblos as necessary. However, by such participation the Pueblos do not acknowledge that they are bound by any decisions made by the JySWPC.

The Pueblos in the region include:

- Pueblo de Cochiti (portions)
- Pueblo of Pojoaque
- Pueblo of San Juan
- Pueblo of Santa Domingo (portions)
- Pueblo of Nambe
- Pueblo of San Ildefonso
- Pueblo of Santa Clara
- Pueblo of Tesuque

1.3 Previous Water Planning in the Region

A variety of studies have been completed that support this water plan, including two key documents:

- The *Water Supply Study Jemez y Sangre Water Planning Region, New Mexico* was prepared by Duke Engineering & Services (Duke) in 2001 specifically for the JySWPC. It compiles water resource information in the Jemez y Sangre Water Planning Region and provides water budgets to support the planning effort. The water supply and water budget data provided in this plan was taken from the Duke report.

- The *Population Projections for the Jemez y Sangre Water Planning Region,* prepared for the JySWPC by the Bureau of Business and Economic Research (BBER) in 2000, provides demographic information for the region and projects future population based on a low estimate and an exponential projection. The document also projects growth using an economic model and discusses the impact of restricting the movement of agricultural water. Population and demographic information included in this plan is primarily from this source.

A number of other water supply and water planning studies have included all or part of the Jemez y Sangre Water Planning Region. Studies funded thus far by the ISC have focused primarily on the Santa Fe area and are, therefore, not comprehensive for the entire planning region. Even so, several of these studies provide important information related to the regional water planning effort.

The *Long-Range Planning Study for the Santa Fe Area - Phase I Report* (Harza et al., 1988) is an excellent report on possible management strategies for the Santa Fe Metropolitan Area. The report discusses alternatives for balancing the three sources of water for the Santa Fe area: (1) the Santa Fe River, (2) groundwater, and (3) imported water. Harza clearly explains the concept of “safe yield” and how values play a role in quantifying safe yield for each community. The alternatives for optimal utilization of the resources and the discussion of issues, although focused on the Santa Fe metropolitan area, apply to region as a whole.

The *Long-Range Planning Study for the Santa Fe Area - Phase II Report* (Harza et al., 1989) was prepared to evaluate the technical and financial feasibility of a regional water system for the Santa Fe Area and to identify a workable administrative framework for its implementation. The study indicated that regionalizing water service would be advantageous as a cost-of-service basis for the region, but major changes in current administrative functions would be needed to move forward with the plan.

The *South Santa Fe County Water Resource Assessment* (BBC, 1992) is another important piece of the regional water planning effort. The public participation component of this assessment revealed little interest in regionalizing water supply in the area, a conclusion that conflicts with the recommendations of the Harza studies.

In addition, several extensive water resource investigations reports do cover a large portion of the region. Santa Fe County has based land development on water availability since 1980 and, along with the Santa Fe Municipal Water Board (SFMWB), commissioned studies to quantify and characterize the water resources in Santa Fe County. The most recent study is the *Water Resource Inventory for Santa Fe County* (DBS&A, 1994), which addressed most of the technical data needs outlined by the regional water planning template for the area within Santa Fe County.

Several hydrogeologic investigations have been undertaken recently in the Jemez y Sangre Water Planning Region. The City of Santa Fe is currently involved in collecting hydrologic data that will assist in numerical modeling and future water planning, and has performed technical studies that will enhance our understanding of the hydrologic system (DBS&A and Watershed West, 2002). Los Alamos National Laboratory (LANL), in cooperation with numerous stakeholders, has developed a numerical model of the Española Basin. LANL has conducted extensive investigations on the hydrogeologic characteristics of the Pajarito Plateau. The U.S. Army Corps of Engineers (USACE), in cooperation with the U.S. Bureau of Reclamation, has developed the Upper Rio Grande Water Operations Model (URGWOM), a surface water management model of the Rio Grande. The City of Española has coordinated an effort to conduct wastewater planning for the Española-Pojoaque area.

LANL began developing a basin-scale model of the Española Basin in 1999 in support of two projects: the Groundwater Protection Program (an applied program focused on the real and potential impacts of LANL operations on the environment) and the Rio Grande Coupled Models Project (a basic-research initiative focused on regional hydrology). The basin model was designed to be flexible, so that iterations between data gathering and model improvements can be used to test conceptual models of flow and transport both on the Pajarito Plateau, where data is fairly dense, and in the larger basin, where data is more sparse. Continued funding for model development is expected from both the Groundwater Protection Program and basic-research initiatives at LANL.

The boundaries of the LANL model extend to the hydrologic and structural limits of the basin. The advantage of modeling the aquifer at this scale is that the model includes all likely areas of recharge and estimates of the total flux through the basin can be achieved through analysis of rainfall and streamflow data. Because the LANL model uses finite-element methodology, the entire basin can be simulated (at a coarse resolution) and areas of interest, such as municipal well fields, can be simulated at a very fine resolution. Finite-element methodology also allows geologic detail to be incorporated into the model; this is difficult with finite-difference codes (e.g., MODFLOW), particularly if the structure of the aquifer units is oblique to the model grid.

One area of research at LANL has been coupling models at various scales, which allows the total water budget implicit in the basin-scale model to be appropriately communicated to smaller-scale, local models. The importance of accurate model coupling was demonstrated in a recent study of capture zones on the Pajarito Plateau, where the influence of a well field outside the local-scale model boundaries proved to be much more important than was previously thought.

The underlying foundation of the LANL model is a three-dimensional geologic model of the basin. The model includes not only the Santa Fe Group, the largest aquifer unit in the basin, but also the volcanic rocks of the Pajarito Plateau and the Precambrian and Paleozoic/Mesozoic rocks of the eastern basin. Understanding the relation between geologic units and hydrostratigraphy has been a major focus of research at LANL.

Several aspects of current model development at LANL are of interest for the Jemez y Sangre region. First, the modeling effort is examining the impact of heat flow on groundwater flow in the basin. This may help to explain some aspects of hydraulic gradients and trace element geochemistry present in the central portion of the basin. Second, the relationship between declining water levels and the potential for increasing concentrations of naturally occurring contaminants such as arsenic, uranium, and unacceptably high levels of chloride and sodium is being examined. Third, time-lapse, high-precision gravity measurements are being conducted throughout the basin in an attempt to directly measure changes in storage. This information will help constrain the model's ability to predict the impact of drought conditions on recharge/discharge relationships.

Additional water planning documents that apply to the region are listed in the bibliography provided in Appendix B.

1.4 Contents and Organization of this Water Plan

The Jemez y Sangre Regional Water Plan was prepared in accordance with guidelines published by the ISC (ISC, 1994). Section 1 provides background information about the planning region and the JySWPC. Supporting information regarding the JySWPC is contained in Appendix A; Appendix B provides a comprehensive water resources bibliography for the region. Section 2 details public involvement in the planning process and the strategy chosen to maximize public involvement. Additional information on the public involvement process, including meeting minutes, newsletters, and public information flyers and fact sheets, is included in Appendix C. Section 3 provides background information related to the planning area including a general description, climate, demographics, and land ownership and use, as well as a summary of the physical characteristics of the sub-basins within the region.

Section 4 presents legal issues that affect water use and planning in the region, including those related to federal, state, and local laws and regulations. Water quality standards and water rights are addressed in this section along with a discussion of ongoing legal issues and local conflicts. Appendix D provides detailed descriptions of the laws and legal issues related to the Jemez y Sangre Regional Water Plan.

Section 5 assesses surface water and groundwater resources for the planning region, providing an analysis of these resources for each of the ten sub-basins in the region and an overview water quality issues for the region. This section also summarizes regional water supply, taking into account legal limitations and issues that might affect supply. Section 6 discusses historical and existing demographics and water use information needed to prepare a water budget and to project future water demand over a 60-year planning horizon. A summary of past and current water conservation measures is also provided. Appendix E provides population data and projections for the regions and various sub-basins.

Sections 7 and 8 address various alternatives for meeting future water demand. Section 7 summarizes the alternatives, including the process used to define and select them, and provides an implementation schedule and summary of projects under consideration. This section also presents various scenarios for five different subregions and describes how demand might be met under each scenario. Section 8 provides recommendations concerning alternatives and their implementation. Detailed analyses of the various alternatives are provided in the white papers included in Appendix F. Appendix G provides the results of a survey of water systems undertaken to determine if and where recommended alternatives are already being implemented in the region.